142-TYPE AMPLIFIERS — DESCRIPTION

1. GENERAL

1.01 This addendum to Issue 1 of Section 024-106-100 is issued to discuss the connections to the ac power transformer T2 and to point out the penalties to be expected when using power transformer taps not agreeing with actual power line supply voltages.

2. TRANSMISSION AND CIRCUIT FEATURES

Add the following paragraphs:

2.161 The primary winding of ac power transformer T2 (KS-14255) is provided with three taps. Tap No. 1 is wired to one end of the primary winding, and is connected through a 2-ampere fuse and a switch to one side of the ac power supply line. The other side of the power supply line is connected to either tap No. 2 or tap No. 3, depending on whether the nominal ac power voltage for the office is in the range 105-115 volts or 115-125 volts, respectively.

2.162 If the power line connections are made to taps 1 and 2 of transformer T2 (105-115-volt range), and the office power line supply voltage is consistently higher (disregarding occasional momentary peaks or surges) the electron tube life will be reduced. If transformer T2 taps 1 and 3 are used (115-125-volt range), and the office voltage is consistently lower (disregarding occasional dips) the power handling capacity may be affected, causing overloading.

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142-TYPE AMPLIFIERS — DESCRIPTION

CONTENTS

	PAGE
1. GENERAL	1
2. TRANSMISSION AND CIRCUIT FEATURES	2
(A) General Features Common to all Four Amplifiers	2
Basic Amplifier Circuit	2
First and Second Stage Tube Connections and Interstage Circuits	2
Phase Inverter Stage and Interstage Circuit	2
Output Circuit	4
Feed-back Circuit	4
Electron Tube Arrangements	4
External Connections	5
Grounding Arrangements	5
Noise	5
(B) Special Features	6
142A Amplifier	6
142B Amplifier	6
142C Amplifier	6
142D Amplifier	7
3. INSTALLATION	8
(A) Mounting	8
(B) Noise Pickup	8
(C) Ventilation	8
(D) Wiring	8
4. PARTS LIST	9

1. GENERAL

1.01 This section describes a series of amplifiers known as the 142-type which includes four different standard models. When mounted in metal cabinets they are known as the 1142-type. The electrical and mechanical features of each of these amplifiers are discussed in detail. Installation information is also included.

1.02 These amplifiers were designed for use in program monitoring, paging and announcing systems and other similar services.

1.03 The 142A amplifier is the basic amplifier and is common to all models of the 142-type. The B, C and D models are merely modifications of the 142A amplifier by the addition of various units to the latter.

1.04 The 142B amplifier is a high gain power amplifier designed to operate from a microphone or other low level input source.

1.05 The 142C amplifier is a medium gain power amplifier provided with a line input coil.

1.06 The 142D amplifier is a high gain power amplifier equipped with a low level input for a microphone or other low level device, and a line level input connection for operation from a telephone line.

1.07 Each of these amplifiers contains its own power supply which requires a 105-125-volt, 50-60-cycle source of power and is equipped with a 2-ampere fuse. A maximum power input of 185 watts (high level audio output and a 125-volt a-c supply) will draw 1.65 amperes of current. The 142A amplifier has two single-sided stages of amplification, a phase inverter stage and a push-pull power stage. Each 142B and 142D amplifier consists of the basic amplifier and an additional 2-tube, 3-stage preamplifier coded 141A. All four amplifiers have substantially flat gain-frequency characteristics from 50 to 15,000 cycles.

1.08 A wide range of input impedances is provided, and depends upon the model and its strapping arrangement. Each amplifier is designed to operate into a wide range of load impedances, the value of which depends upon the strapping of the output transformer.

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1.09 The 142-type amplifier, as supplied, will deliver into its optimum load impedance a power of 12 watts (+41 dbm) over the frequency range of 50-7500 cycles with less than 5% distortion. If Western Electric 350B vacuum tubes are used in the output stage the amplifier can be reconnected for an output of 25 watts (+44 dbm) into its optimum load impedance over the frequency range of 50-7500 cycles with less than 5% distortion.

1.10 Each of the four models of the 142-type amplifier is furnished with a continuously adjustable gain or volume control and a power switch mounted on the side of the chassis in a position for cabinet mounting. The designation plate identifies the volume control with VOL etched on it below the control knob, and also indicates positions of relative volume from step 0 to step 10 in clockwise direction. The power switch is labeled ON-OFF. When the 142-type amplifier is to be rack mounted, a 405B-15 panel is used as a front mat, and must be ordered and installed locally. In this case it is necessary to rotate the volume and power controls 90° to a position where they will be available through the cutout of the 405B-15 panel.

1.11 In addition to the continuously adjustable master gain control, the 142B and 142D amplifiers have screwdriver-operated gain controls which are associated with the input stage (141A preamplifier) and are adjustable in three steps of 10 db each. The 142D amplifier has a third gain control potentiometer which is continuously adjustable and controls the line coil input.

1.12 The maximum gains of these amplifiers vary over a wide range, depending upon the model and, in most cases, the particular input arrangement used. Table 1, on Page 12, shows the gains obtained with various input arrangements.

1.13 The apparatus units of the four models are mounted on a 19" x 6-3/4" chassis and the apparatus extends approximately 5-7/8" above the chassis. As normally supplied each amplifier is arranged to mount in a cabinet such as the KS-13625 cabinet (List 3 for the A, B and C models; List 4 for the D model). These cabinets measure 19-3/4" wide, 11-1/2" high and 10-1/4" deep. When rack mounted using the 405B-15 panel, the amplifier occupies 8-3/4" of vertical space.

1.14 Fig. 1 shows a front view of the 142A amplifier. The other three models are similar in appearance except that additional apparatus units are mounted on the left side of the chassis.

1.15 Commercial types of electron tubes are used in these amplifiers except in the final push-pull stage where either commercial or Western Electric type tubes can be used depending upon the output power desired.

1.16 Detailed performance data for each of the four amplifiers operating under various conditions are shown in Table 1, on page 12.

2. TRANSMISSION AND CIRCUIT FEATURES

2.01 The schematic diagram of the 142A amplifier is shown in Fig. 2 on Page 13. Fig. 4, on Page 14, shows a schematic diagram of the input circuit arrangement of the 142B amplifier. Figs. 3, 5 and 6 show the circuit arrangements of the 142B, 142C and 142D amplifiers, respectively in block diagrams.

(A) General Features Common to All Four Amplifiers

Basic Amplifier Circuit

2.02 As previously mentioned, the 142A amplifier circuit is common to all four models. It consists of two stages of voltage amplification, a phase inverter stage and a push-pull output stage.

First and Second Stage Tube Connections and Interstage Circuits

2.03 The grid of tube V1a is connected to the movable arm of potentiometer P1. The cathode is connected to a feed-back circuit from the output of the second stage.

2.04 The interstage circuit consists essentially of resistance coupling through plate load resistor R5, coupling capacitor C2 and grid resistor R6.

2.05 The plate of tube V1b is connected to the feed-back circuit which returns to the cathode of the first stage. The interstage circuit is similar to that between the first two stages; R8 (8.1 and 8.2), C4 and R9 serve the same purposes as R5, C2 and R6 respectively.

Phase Inverter Stage and Interstage Circuit

2.06 Tube V2a amplifies the signal to V3 and also feeds the signal to the grid of V2b via coupling capacitor C5. The grid of V2a is coupled to the preceding stage through R28. The latter is a stabilizing resistor to reduce capacitive effects and prevent any tendency toward osoillation. The cathode is connected to the return side of a feed-back circuit from the output transformer. In addition, an equalizing

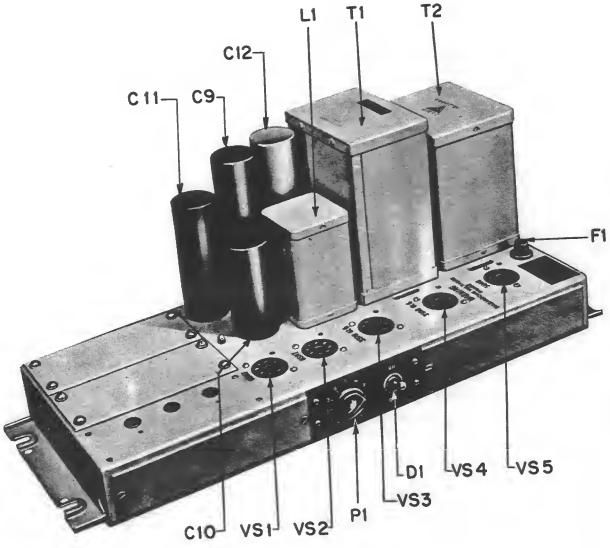


Fig. 1 - 142A Amplifier

network in the form of R29 and C13 is part of the feed-back circuit, and is employed to increase the gain slightly at 15,000 cycles. The values of R29 and C13 are those which will allow the gain-frequency requirements to be met, and are determined at the factory.

2.07 Tube V2b is connected in such a manner that its sole function is to cause the signal applied to the grid of V4 to be 180° out of phase with, and at the same level as, that applied to the grid of V3. The grid bias on V2b is such that this tube operates essentially at unity gain.

2.08 The interstage circuit consists of plate resistors R14 and R15, coupling capacitors C7 and C8 and grid resistors R17 and R18. C6 and R16 comprise a network designed to reduce the gain of the system at approximately 20,000 cycles to prevent the occurrence of oscillation.

Output Circuit

2.09 The plate voltage to the last stage tubes is supplied through the midpoint of the primary of the output transformer T1. The ends of this primary winding are connected directly to the plates of V3 and V4. The grids of the latter are connected to the coupling capacitors C7 and C8 through resistors R19 and R20 respectively. These resistors are employed to stop parasitic oscillations in the output tubes. The cathodes are connected to R22 which is a wire-wound resistor consisting of two sections (R22.1 and R22.2) so that one section (R22.2) can be strapped out when Western Electric 350B electron tubes are used. The cathodes are also connected to by-pass capacitor C9.1. The inclusion of the latter reduces third harmonic distortion caused by unbalances in the push-pull stage, particularly due to unmatched output tubes. The plate voltage used depends upon the power output required. If the normal output of 12 watts is sufficient, the plate-to-ground voltage for a pair of 6L6 electron tubes will be about 375 volts. If higher power output is required, the 6L6 tubes must be replaced with Western Electric 350B electron tubes and several wiring changes must be made. In this condition the plate-to-ground voltage will be about 400 volts.

2.10 The output transformer has five secondary windings, four of which may be connected in a number of ways so that each of the amplifiers can be arranged for operation into a large selection of nominal load impedances from 1.5 ohms to 600 ohms, or into a 70-volt loudspeaker distribution circuit. The transformer is specially designed to close tolerances because feedback is taken from the secondary side (fifth winding), and because the secondary windings are arranged to be connected in series or parallel to obtain a required output impedance. The output impedance of the amplifier, as seen looking back into it from any one of the output terminal arrangements, is approximately 1/4 of the load impedance of that particular output arrangement or transformer strapping. Resistor R31 (across amplifier terminals 19 and 20) reduces excessively high voltage surges which might occur when a 142-type amplifier is driven hard with no load connected to the output. Voltage breakdowns between terminals on the output transformer, or between lead connections inside the power amplifier tubes may result if these surges are permitted to occur. Capacitor C14 (across terminals 7 and 8 of T1) provides a greater margin against the occurrence of singing when the amplifier has no load or is very lightly loaded. Earlier production models of the 142-type amplifier did not employ R31 and C14. It may be advisable to modify such amplifiers locally.

Feed-back Circuit

2.11 Referring to the schematic, Fig. 2, on page 13, there are two main feed-back circuits. One circuit is from a winding on the secondary side of transformer T1 through resistor R21 to the cathode of the driver stage. Resistor R29 and capacitor C13 comprise an equalizing network which is also part of this feed-back circuit. The equalizing network reduces the feedback by a small amount at about 15,000 cycles and thus causes a small increase in gain at about that frequency. The other main feed-back circuit is from the plate of tube V1b through resistor R4 to the cathode of tube V1a.

Electron Tube Arrangements

2.12 The tubes used in the amplifying circuit of the 142A amplifier are of the 6.3 volt heater type. The heaters of the four tubes (V1, V2, V3 and V4) are wired in parallel and are connected to the 6.3-volt winding of the power transformer T2. Commercial types of electron tubes are used except where greater output is desired; in which case Western Electric type tubes must be used in the output stage with attendant wiring changes.

2.13 A filamentary type of rectifier tube is specified and it too is of the commercial type.

2.14 The code numbers, quantity and designation are given in Table 2 for the amplifier and rectifier tubes required. The additional tubes needed for the B and D models are also included.

TABLE 2

Type	Quantity	Designation
6SN7GT	2	V1, V2
6L6 or WE 350B*	2	V3, V4
5U4G or 5R4GY	1	V5
+6J7	1	V1 (in the 141A preamplifier)
+6SN7GT	1	V2 (in the 141A preamplifier)

* Used only where greater output power is desired.

\+ Used only in 142B and 142D amplifiers.

Caution: The tubes should not be handled while the amplifier is in operation, due to the danger of burns, particularly in the case of the rectifier and final stage amplifier tubes.

External Connections

2.15 External connections to the 142-type amplifiers are made to terminal strips (terminals 1 to 22) which are recessed at the front edge of the chassis. The terminals extend through the strips permitting connections to be made either at the front or rear of the strips. Terminals 23 to 28 will be found on a terminal strip on the wiring side of the chassis. Holes are provided at the ends of the chassis to permit entrance of the external wiring. The recessed terminal strips are protected by screwfastened cover plates which can be removed when making connections. These plates should be replaced before power is applied to the amplifier.

2.16 Terminals 1 through 8, inclusive, are not used on the 142A amplifier. They are used as input terminals on the B, C or D models as shown in Figs. 3, 5 and 6 and Table 1, and in modifications of the 142A amplifier as described in Section 024-106-101. The normal connections for the remaining terminals are as follows:

Terminal Numbers	External Connections
* 9 and 11	High impedance input on 142A amplifier
*10 and 11	High impedance input on 142A amplifier
11 and 12	Ground
13 through 20, inclusive	Output terminals
21 and 22	105-125-volt, 50-60-cycle a-c power source
23	Basic input terminal (see Figs. 2 and 3)
24	Basic input terminal normally strapped to terminal 10 (see Fig. 2)
25 and 26	Plate supply for preamplifier(s) (25 positive)
+27 and 28	Heater supply for preamplifier(s)

* If only one input is used, the other ungrounded terminal (10 or 9) should be connected to terminal 11. (See Fig. 2.)

\+ This supply must not be grounded since its center tap is connected to a bias voltage within the amplifier. This bias voltage is usually beneficial in reducing noise generated in preamplifer electron tubes.

Grounding Arrangements

2.17 Terminals 11, 12 and 26 of the amplifier are connected to the chassis. A good external ground should be connected to either terminal 11 or 12.

Noise

2.18 With any of the four models adjusted for maximum gain, and the output terminals connected to the load impedance for which the output transformer is strapped, the noise at the output terminals should not be higher than the figures given in Table 3.

TABLE 3

Amplifier	Noise Using 2B Noise Measuring Set*- (Flat Weighting)
142A or C	60 dba
142B	85 dba
142D - Low level input	85 dba
142D - Line level input	60 dba

* Shielded connecting cords and a good ground on terminal 11 of the amplifier must be used.

(B) Special Features

142A Amplifier

2.19 This amplifier, when used as the basic model, has two high impedance input channels (terminals 9 and 11, and terminals 10 and 11) which may be operated from a variety of input sources. Each input has an internal impedance of over 250,000 ohms, and may be operated from any source impedance from zero to 250,000 ohms. Each input essentially consists of resistors R1 and R2 respectively. If only one input is used, the other ungrounded terminal (10 or 9) should be connected to terminal 11. Fig. 2, on page 13, shows the arrangement. This amplifier is equipped with a continuously adjustable potentiometer (P1).

142B Amplifier

2.20 This is a high gain amplifier consisting of a 142A amplifier and a preamplifier coded 141A amplifier. Fig. 3 shows a block diagram of the 142B amplifier. In addition to the master gain control (P1) in the common circuit there is an additional control which is part of the 141A amplifier and is adjustable in 3 steps of 10 db each. Referring to Fig. 4, on page 14, it will be seen that the input circuit, which comprises the 141A preamplifier, consists of a 3-stage low level amplifier. It has a 1000-cycle gain which is adjustable from 40 to 70 db. The input transformer will accommodate microphones or other low level devices having a nominal source impedance of 30, 250 or 600 ohms. This transformer has a permalloy core and case. It is mounted on the amplifier chassis by means of a clamp that may be loosened to allow the transformer to be rotated to a position of minimum noise pickup when the amplifier is exposed to a magnetic field. Resistor R4 is common to the cathodes of both the first amplifier tube V1 and the second section of tube V2. Current in the cathode circuit of V2 is of such phase and amplitude as to introduce stabilized feedback in the cathode circuit of V1. Resistors R5, R6 and R7 may be switched in multiple with R4, thereby changing the amount of feedback voltage, and at the same time, varying the gain in steps of 10 db. The output of the 141A preamplifier is a cathode follower, and no output transformer is used for coupling to the input of the 142A amplifier.

2.21 It will be observed that a high impedance input is available on the 142B amplifier as well as on the C and D models. It is incidental, since it appears on the basic or 142A amplifier (terminals 10 and 11) in each case.

142C Amplifier

2.22 This amplifier consists of the basic 142A amplifier and a 713A apparatus unit. A block diagram of this amplifier is shown in Fig. 5. The 713A apparatus unit consists of a 618D input transformer that provides a choice of several line level transformer inputs. This transformer is magnetically shielded by a container of high permeability material against electromagnetic pickup, and may be rotated to a position of minimum pickup if exceptionally strong fields are encountered.

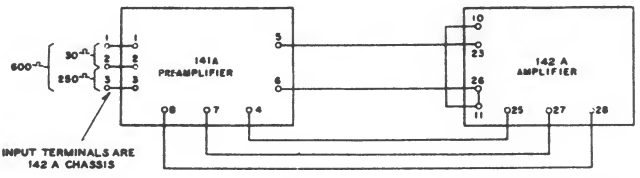


Fig. 3 - 142B amplifier - Block Diagram

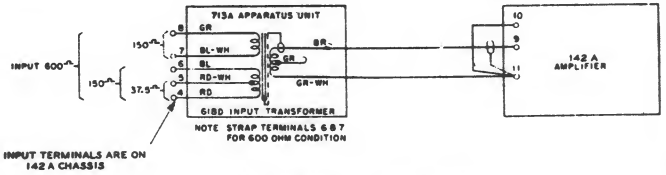


Fig. 5 - 142C Amplifier - Block Diagram

142D Amplifier

2.23 This consists of a basic 142A amplifier, with a 141A preamplifier and an additional input transformer mounted on its chassis. Fig. 6 shows a block diagram of the 142D amplifier. The input arrangement chosen depends upon the type of service in which the amplifier is used, and the maximum input levels which may be encountered.

Line Level Input

2.24 This arrangement provides a transformer input for operation from telephone lines for wired music and similar service. It consists of a 142A amplifier connected to a 713B apparatus unit through a transfer switch. This 713B apparatus unit consists essentially of a small gray-enameled metal box provided with mounting flanges and removable backplate. The box contains a 618D input transformer, a 50,000-ohm volume control mounted on the top of the box, and a 4-pole, 2-position, non-shorting switch mounted in front of the box in line with the transformer. The bottom of the box is open. A designation plate with a clearance hole for the switch is assembled to the front of the box. Mounting holes are also provided in the box for another switch or volume control, and by reversing the designation plate, suitable markings are indicated for this purpose. (It is also necessary to drill the plate at the second mounting position.)

2.25 The 618D input transformer has an electrostatic shield between the primary and secondary windings. This shield is connected internally to the core of the transformer (but not the case) and appears externally as a metallic braid over the "brown" lead. It is important that this shield be connected to ground terminal 11 or 26 of the 142A amplifier, particularly if the input source is a telephone line. In some of the ear-

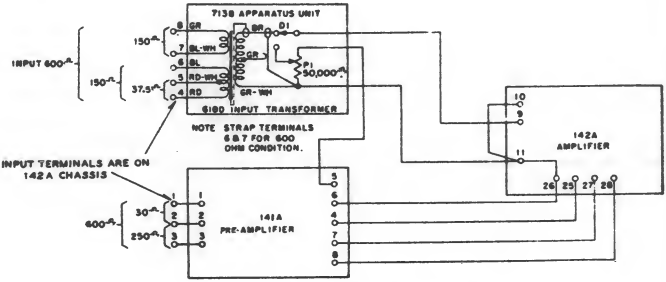


Fig. 6 - 142D Amplifier - Block Diagram

lier 713B apparatus units this shield was not connected at the time of manufacture and should be checked. The shield should be connected to the terminal on the potentiometer P1 on which the "green-white" and "black" leads are connected, as the latter is intended to be connected to terminal 11 of the 142A amplifier.

2.26 The switch mounted on the apparatus unit provides means for transferring the input of the 142A amplifier from the transformer line level input to the component 141A preamplifier. The volume control provides a means for adjusting the output of the 141A preamplifier (low level input) independently of the line level input.

Low Level Input

2.27 This input consists of the 141A preamplifier and the arrangement is the same as that in the 142B model except for the transfer switch and additional volume control described in Paragraph 2.26.

3. INSTALLATION

(A) Mounting

3.01 The amplifiers are mounted either vertically or horizontally in an apparatus cabinet or on a relay rack.

(B) Noise Pickup

3.02 A shielded power transformer is employed in the 142-type amplifiers. The noise pickup from one amplifier into an adjacent one will be negligible.

3.03 The 142C and 142D amplifiers are furnished with input transformers which are shielded against electromagnetic pickup as described in Paragraphs 2.22 and 2.24. No appreciable magnetic pickup will be encountered if these amplifiers are mounted several inches from any disturbing source of power equipment.

(C) Ventilation

3.04 In general the 142-type amplifier will operate satisfactorily at room ambient temperatures of approximately 109°F. using the 12-watt connection, or approximately 100°F. using the 25-watt connection where free air circulation adjacent to the amplifier is provided.

3.05 The KS-13625 type cabinet which mounts a single amplifier has sufficient openings to provide adequate ventilation within the limits given, under normal conditions, as the cabinet design provides for spacing from the mounting surfaces whether wall mounted, or table or shelf mounted. If the cabinet is located in a small enclosed space, and the ambient temperature is higher than recommended, after the amplifier has been in operation for several hours, means should be provided for forced ventilation.

3.06 Several 142-type amplifiers may be mounted in a relay rack or equipment cabinet without forced ventilation provided 100°F. room temperature is not exceeded and recommended spacings between amplifiers are used, if at least 100 square inches of open area are provided both above the top amplifier and below the bottom amplifier in an enclosed cabinet enclosure. The recommended minimum spacings between vertically rack mounted amplifiers (electron tubes horizontal) follows:

Power	Number of Amplifiers	Minimum Spacing
12 watts	5 or 6	*1-3/4"
25 watts	2	5-1/4"
	3	7"
	4 or 5	8-3/4"

* This is the minimum recommended spacing. It will be provided automatically by the use of a 405B-15 panel with each amplifier.

(D) Wiring

3.07 On some 142-type amplifiers, the a-c power terminals are located at the end of the output terminal strip next to the wiring entrance hole in the chassis. It is possible, therefore, for leads connecting to the output terminals and brought in through the chassis hole next to the a-c terminals to touch the a-c power terminals. Where this is so, the amplifier output leads should have insulation approved for 115-volt a-c power applications. If such wire is not used, the output leads should have additional insulation applied over them for a distance of at least one inch to each side of the a-c terminals.

3.08 Earlier production models of 142-type amplifiers employed KS-13821 power transformers. The difference between this transformer and KS-14255 is in the method of bringing out the various windings. The latter are brought out to terminals on the KS-14255-type, and colored leads were employed in the KS-13821-type. The relationship is indicated below:

KS-14255 Terminal Numbers	KS-13821 Lead Colors
1	Black
2	Black-Yellow
3	Black-Red
4	Red-Green
5	Red-Yellow
6	Red
7	Orange-Black
8	Orange
9	Yellow
10	Yellow
11	Green
12	Green-Yellow
13	Green

3.09 Fig. 7, on Page 15, shows a wiring diagram of the 142A amplifier. Fig. 8, on Page 16, shows a similar diagram for the 141A preamplifier.

4. PARTS LIST

4.01 The item designations shown in Table 4 are those indicated on the schematic drawing for the 142A amplifier as shown in Fig. 2. Table 5 shows the additional parts required for the 142B amplifier. This, in effect, is a list of parts for the 141A preamplifier. Table 6 shows the additional parts for the 142C amplifier. The additional parts for the 142D amplifier are listed in Table 7.

TABLE 4

List of Parts for 142A Amplifier

Item	Description
	Allen-Bradley Co. Resistors or Equivalent
R1, R2, R9	Type EB .24 meg. ± 5%.
R3, R12	Type EB 2400 ohms ± 5%.
R4	Type EB 100,000 ohms ± 5%.
R6	Type EB .51 meg. ± 5%.
R15	Type GB 51,000 ohms ± 5%.
R21	Type EB 16,000 ohms ± 5%.
R7	Type EB 1500 ohms ± 10%.
R10, R28	Type EB .47 meg. ± 10%.
R11	Type EB 2.2 meg. ± 10%.
R16	Type EB 15,000 ohms ± 10%.
R17, R18	Type EB .1 meg. ± 10%.
R19, R20	Type EB 100 ohms ± 20%.
R5	Type GB 0.1 meg. ± 10%.
R14	Type HB 0.1 meg. ± 10%.
R8.1	Type GB 160,000 ohms ± 5%.
R8.2	Type HB 75,000 ohms ± 5%.
R13	Type EB 30,000 ohms ± 5%.
R23, R24	Type HB 3000 ohms ± 5%.
R25	Type HB 8200 ohms ± 10%.
R26, R27, R32, R33	Type HB 47,000 ohms ± 5%.
R31	Type HB 10,000 ohms ± 10%.
R30	Type GB 0.51 meg. ± 5%.
R29	Type EB 820 ohms or greater.
	International Resistance Corp. Resistors
R22	Type MW3 250 ohms ± 10% (Total). Term. 1-2 100 ohms ± 10% 1.0 watt. Term. 2-3 150 ohms ± 10% 4.17 watts.
	Cornell-Dubilier Capacitors
C1, C2, C4, C5, C7, C8	TVC 6S5-6 .05 MF
C6	5W 360 MMF

TABLE 4 Continued

Item	No. Req.	Description
		Sprague Electric Co. Capacitors
C9		Type DEW 80 MFD 450 V, 30 MFD 300 V; 1-3/8" Dia. x 4-3/4" high with insulating washer, with cover (Sprague D-13812).
C10		Type DEW 80 MFD 300 V; 1-3/8" Dia. with insulating washer and 3-1/4" high, with cover (Sprague D-13814).
C11		Type DEW 30 MFD 475 V; 30 MFD 475 V; 1-3/8" Dia. x 4-1/4" high with insulating washer, with cover (Sprague D-13813).
C12		Type 06P3 4 MFD 600 V.
C14		Type 76P Prokar .022 MFD, 400 V.
		Aerovox Corporation Capacitors
C13		Type 1467 (This capacitor is 0.01 mf or less.)
		Miscellaneous Components
D1	1	Switch 86993 GC (Arrow-Hart & Hegemann).
L1	1	KS-14256 Retard Coil (Western Electric Co.).
T1	1	519A Output Transformer (Western Electric Co.).
T2	1	KS-14255 Power Transformer (Western Electric Co.).
FM1	1	KS-5842 L05 or Bussman HKP Fuse Holder.
P1	1	Volume Control, Allen-Bradley JA-5041, lug option #1, lock-washer M-2898, Nut M-2786, Bushing & Shaft P-2040.
	5	T9881 Electron Tube Socket (Cinch Mfg. Co.).
	1	Knob S-292-3L (Kurz-Kasch, Inc.).
	3	Cat. #48182 (Dot plug button nic. plt. fin.).
	2	Cat. #48155 (United-Carr Fastener Corp.)
F1	1	Cat. #312002 Fuse (2 amp.) (Littelfuse, Inc.) or Bussman Type AGC (2 amp.).

TABLE 5

List of Additional Parts for 142B Amplifier

Item	Description
	Allen-Bradley Co. Resistors or Equivalent
R1	Type EB 1.0 meg. ± 10%.
R2	Type EB 0.1 meg. ± 10%.
R3	Type EB 1600 ohms ± 5%.
R4	Type EB 910 ohms ± 5%.
R5	Type EB 15 ohms ± 5%.
R6	Type EB 68 ohms ± 5%.
R7	Type EB 300 ohms ± 5%.
R8, R10	Type EB 1 meg. ± 10%.
R9	Type EB .24 meg. ± 5%.
R11, R14, R19	Type EB .1 meg. ± 10%.
R12	Type EB 2700 ohms ± 10%.
R15, R16	Type EB .82 meg. ± 10%.
R17	Type EB .47 meg. ± 10%.
R13	Type HB 5100 ohms ± 5%.
R18	Type HB 8200 ohms ± 5%.

TABLE 5 Continued

Item	Description
	Sprague Electric Co. Capacitors or Equivalent
C1, C2	64P11 .02 mf.
C3, C4	PPX24B20 0.1 mf.
C5	PPX24B15 .03 mf.
C6	DFP 50 mf 150 V.
C7	DFP 10 mf 50V, 20 mf 350V, 20 mf 450V, 20 mf 25V.
	Miscellaneous Hardware

Number Required	Description
1	(T1) 618B Input Transformer (Western Electric Co.)
1	(D1) SPO-58101 Type 3214 4-Position Switch (P. R. Mallory Co.).
1	Special Aerovox Mounting Ring Type E, 1-1/2 dia.
4	61F Rubber Grommet (Pierce Roberts,Trenton, N. J.).
2	KS-13364 List 3 Electron Tube Socket (Western Electric Co.).
1	Grid Cap Shield (#1552 from Insuline Corp., Long Island City, N. Y.).

TABLE 6

List of Additional Parts for 142C Amplifier

Item	Description
	713A Apparatus Unit
T1	618D Input Transformer (Western Electric Co.).
	Special Aerovox Mtg. Ring Type E 1-1/2" dia. Obtain from Aerovox Corp., New Bedford, Mass., with .138-32 x 1-1/4" R.H.M. Steel Screw #6 (.138) .055 x 0.40 Steel Lockwasher and #6 (.138)-32 x 5/16" Hex. Steel Nut. All Zinc Plate Finish.

TABLE 7

List of Additional Parts for 142D Amplifier

Item	Description
	713B Apparatus Unit
D1	BL-148173 Switch (Western Electric Co.).
P1	JU-5031 Potentiometer, 50,000 ohms, lug option #3, Bushing and Shaft Designation FP-2040, Electrical Designation U-5031, supply with M-2898 Lockwasher and M-2786 Nut. Flat on shaft to be located 180 degrees from standard location. Allen-Bradley Co., Milwaukee, Wisconsin.
T1	618D Input Transformer (Western Electric Co.).
	Special Aerovox Mtg. Ring Type E, 1-1/2" dia. Obtain from Aerovox Corp., New Bedford, Mass., with .138-32 x 1-1/4" R.H.M. Steel Screw, #6 (.138) .055 x 0.40 Steel Lockwasher and #6 (.138)-32 x 5/16" Hex. Steel Nut. All Zinc Plate Finish.
	BA-10068-19 Knob (for D1 and P1) (Western Electric Co.).

AMPLIFIER (See Note 1)	MAXIMUM LOCKED-OUT GAIN WITH OPERATING SOURCE AND LOAD IMPEDANCES	GAIN CONTROL	AMPLIFIER TERMINALS TO WHICH INPUT SHOULD BE CONNECTED	INPUT CIRCUIT - TERMINAL STRAPPING ARRANGEMENTS	SOURCE IMPEDANCE		IMPEDANCE LOOKING INTO THE INPUT TERMINALS OF EACH AMPLIFIER	LOAD IMPEDANCE INTO WHICH EACH AMPLIFIER IS ADJUSTED TO OPERATE (See Note 2)	INTERNAL OUTPUT IMPEDANCE	NOISE (Max. Gain) (See Note 3)	FREQUENCY CHARACTERISTICS
					Nominal	Operating Range					
1A2A											
High Impedance											
Input Arrangement No. 1	50 db	Continuously Adjustable	9 & 11	None	600 Ω	0-250,000 Ω	Greater than 250,000 Ω	1.5 - 600 Ω or 70 Volt Loudspeaker Distribution Ckt.	Approx. 1/4 of Load Impedance	60 dba	± 1 db 50-15,000 ~
" " No. 2			10 & 11								
1A2B											
Low Level										85 dba	± 1 db 50-10,000 ~ ± 1.5 db 50-15,000 ~
Input Arrangement No. 1	115 db	Preamp. Gain Control Adjustable in 3 Steps of 10 db Each, and a Continuously Adjustable Potentiometer	1 & 3	None	600 Ω	± 40% of Nominal	Greater than 10 Times Nominal Impedance Over Most of Frequency Range				
" " No. 2			2 & 3		250 Ω						
" " No. 3			1 & 2		30 Ω						
High Impedance				Strap 10 & 11 When No. 4 Not Used						60 dba	± 1 db 50-15,000 ~
Input Arrangement No. 4	50 db	Continuously Adjustable Pot. Only	10 & 11		600 Ω	0-250,000 Ω	Greater than 250,000 Ω				
1A2C											
Line Level Transformer										60 dba	± 1.5 db 50-10,000 ~
Input Arrangement No. 1	69 db	Continuously Adjustable	4 & 5	Strap 6 & 7	37.5 Ω	± 40% of Nominal	Approx. 6 Times Nominal Impedance Over Most of Frequency Range				
" " No. 2			4 & 6		150 Ω						
" " No. 3			7 & 8		150 Ω						
" " No. 4			4 & 8		600 Ω						
High Impedance				Strap 10 & 11 When No. 5 Not Used						60 dba	± 1 db 50-15,000 ~
Input Arrangement No. 5	50 db	Continuously Adjustable Pot. Only	10 & 11		600 Ω	0-250,000 Ω	Greater than 250,000 Ω				
1A2D											
Low Level										85 dba	± 1 db 50-10,000 ~ ± 1.5 db 50-15,000 ~
Input Arrangement No. 1	115 db	Preamp. Gain Control Adjustable in 3 Steps of 10 db Each, and 2 Continuously Adjustable Potentiometers	1 & 3	None	600 Ω	± 40% of Nominal	Greater than 10 Times Nominal Impedance Over Most of Frequency Range				
" " No. 2			2 & 3		250 Ω						
" " No. 3			1 & 2		30 Ω						
Line Level Transformer										60 dba	± 1.5 db 50-10,000 ~
Input Arrangement No. 4	69 db	Continuously Adjustable Pot.	4 & 5	Strap 6 & 7	37.5 Ω	± 40% of Nominal	Approx. 6 Times Nominal Impedance Over Most of Frequency Range				
" " No. 5			4 & 6		150 Ω						
" " No. 6			7 & 8		150 Ω						
" " No. 7			4 & 8		600 Ω						
High Impedance				Strap 10 & 11 When No. 8 Not Used						60 dba	± 1 db 50-15,000 ~
Input Arrangement No. 8	50 db	Continuously Adjustable Pot.	10 & 11		600 Ω	0-250,000	Greater than 250,000 Ω				

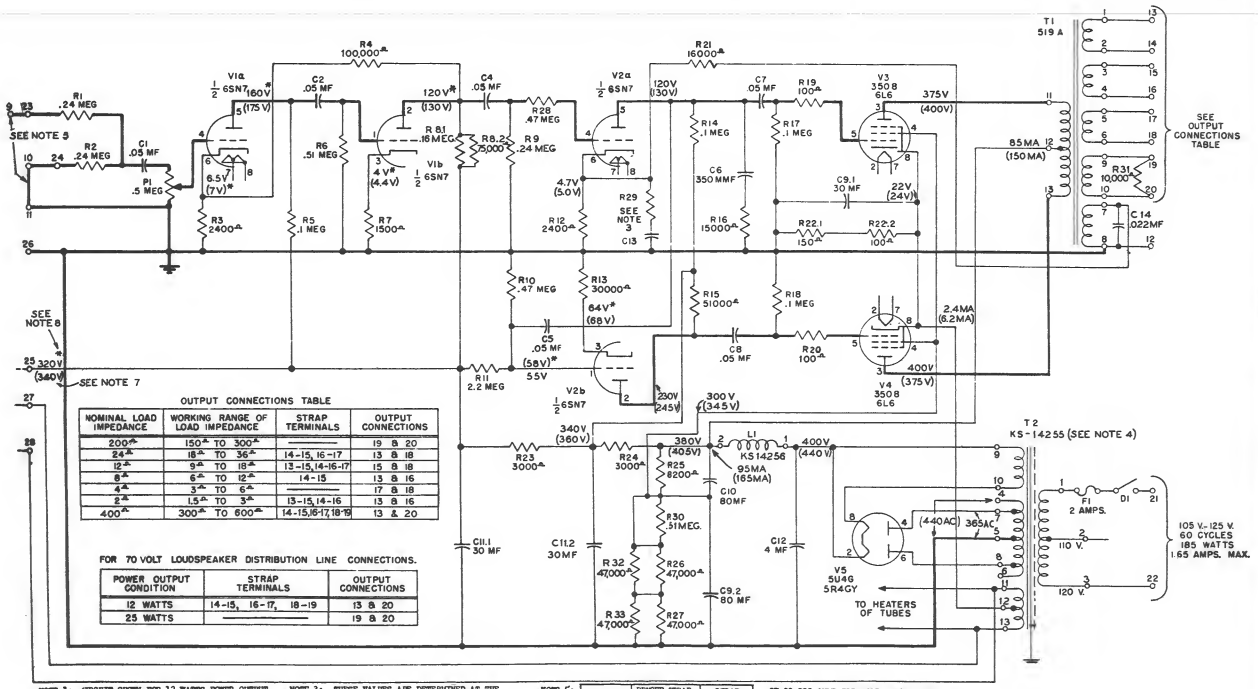
Note 1: The input arrangement numbers are arbitrary. They are intended to show the number of possible input arrangements on each amplifier. Similar input arrangement numbers between amplifiers have no intended meaning.

Note 2: The schematic diagram shows a table of output connections.

Note 3: Using 2B noise measuring set with flat weighting.

TABLE 1

1A2-TYPE AMPLIFIERS - TYPICAL OPERATING CHARACTERISTICS



OUTPUT CONNECTIONS TABLE

NOMINAL LOAD IMPEDANCE	WORKING RANGE OF LOAD IMPEDANCE	STRAP TERMINALS	OUTPUT CONNECTIONS
200Δ	150Δ TO 300Δ	———	19 & 20
24Δ	18Δ TO 36Δ	14-15, 16-17	13 & 18
12Δ	9Δ TO 18Δ	13-15, 14-16-17	15 & 18
8Δ	6Δ TO 12Δ	14-15	13 & 16
4Δ	3Δ TO 6Δ	———	17 & 18
2Δ	1.5Δ TO 3Δ	13-15, 14-16	13 & 16
400Δ	300Δ TO 600Δ	14-15, 16-17, 18-19	13 & 20

FOR 70 VOLT LOUDSPEAKER DISTRIBUTION LINE CONNECTIONS.

POWER OUTPUT CONDITION	STRAP TERMINALS	OUTPUT CONNECTIONS
12 WATTS	14-15, 16-17, 18-19	13 & 20
25 WATTS	———	19 & 20

NOTE 1: CIRCUIT SHOWN FOR 12 WATTS POWER OUTPUT.

NOTE 2: FOR 25 WATTS OUTPUT THE FOLLOWING CHANGES ARE NECESSARY:
(A) USE 350B TUBES.
(B) SHORT R22.2.
(C) AT TRANSFORMER T2 TRANSFER LEAD FROM TERMINAL 7 TO TERMINAL 4 AND LEAD FROM TERMINAL 8 TO TERMINAL 6.
(D) REMOVE SHORT ACROSS R30.

NOTE 3: THESE VALUES ARE DETERMINED AT THE FACTORY TO MEET GAIN-FREQUENCY REQUIREMENTS. R29 IS 820 OHMS OR GREATER AND C13 IS .01 MF OR LESS.

NOTE 4: REFER TO TEXT WHEN T2 IS KS-13821.

NOTE 5:

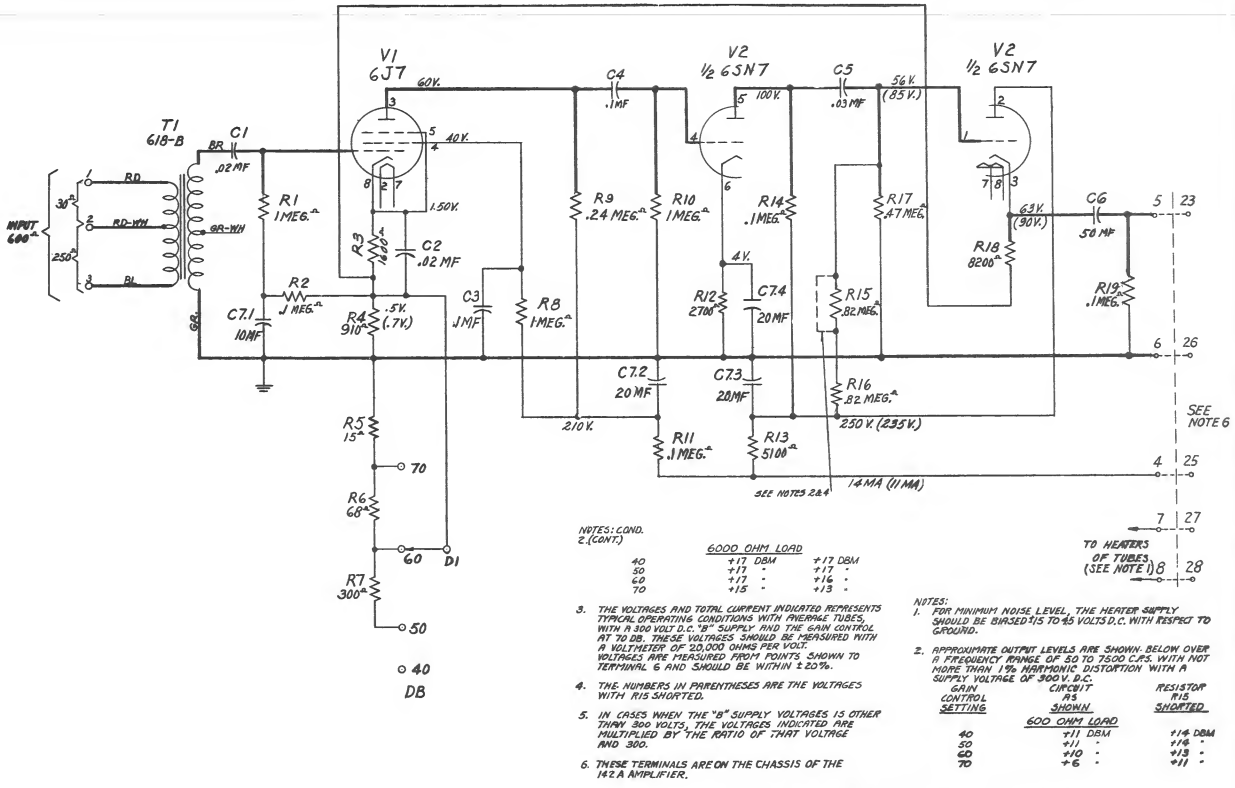
AMPLIFIER	REMOVE STRAP BETWEEN TERM.	STRAP TERMINALS
142B	9-23	10 TO 11
142C	-	10 TO 11
142D	-	10 TO 11

NOTE 6: THE VOLTAGES AND CURRENTS SHOWN REPRESENT TYPICAL VALUES FOR A QUIESCENT CONDITION WITH AVERAGE TUBES AND OPERATED FROM A 60-CYCLE, 120-VOLT POWER SOURCE. THE D-C VOLTAGE SHOULD BE MEASURED WITH A VOLTMETER OF 20,000 OHMS PER VOLT. VOLTAGES ARE MEASURED FROM POINTS SHOWN TO TERMINAL 26 AND SHOULD BE WITHIN ± 20%.

NOTE 7: THE NUMBERS IN PARENTHESES ARE THE VOLTAGES FOR THE 25 WATT CONDITION.

NOTE 8: THE ASTERISK APPLIES TO BOTH NUMBERS AND INDICATES THAT THESE VALUES WILL BE 80% OF THOSE SHOWN WHEN A 142B OR 142D AMPLIFIER CONNECTION IS USED.

Fig. 2 - 142A Amplifier Schematic



NOTES: COND.
2. (CONT.)

	6000 OHM LOAD	
40	+17 DBM	+17 DBM
50	+17 "	+17 "
60	+17 "	+16 "
70	+15 "	+13 "

3. THE VOLTAGES AND TOTAL CURRENT INDICATED REPRESENTS TYPICAL OPERATING CONDITIONS WITH AVERAGE TUBES, WITH A 300 VOLT D.C. "B" SUPPLY AND THE GAIN CONTROL AT 70 DB. THESE VOLTAGES SHOULD BE MEASURED WITH A VOLTMETER OF 20,000 OHMS PER VOLT. VOLTAGES ARE MEASURED FROM POINTS SHOWN TO TERMINAL 6 AND SHOULD BE WITHIN ± 20%.

4. THE NUMBERS IN PARENTHESES ARE THE VOLTAGES WITH R15 SHORTED.

5. IN CASES WHEN THE "B" SUPPLY VOLTAGES IS OTHER THAN 300 VOLTS, THE VOLTAGES INDICATED ARE MULTIPLIED BY THE RATIO OF THAT VOLTAGE AND 300.

6. THESE TERMINALS ARE ON THE CHASSIS OF THE 142 A AMPLIFIER.

NOTES:
1. FOR MINIMUM NOISE LEVEL, THE HEATER SUPPLY SHOULD BE BIASED 4½ TO 4⅝ VOLTS D.C. WITH RESPECT TO GROUND.

2. APPROXIMATE OUTPUT LEVELS ARE SHOWN BELOW OVER A FREQUENCY RANGE OF 50 TO 7500 CPS. WITH NOT MORE THAN 1% HARMONIC DISTORTION WITH A SUPPLY VOLTAGE OF 300 V. D.C.

GAIN CONTROL SETTING	CIRCUIT AS SHOWN 600 OHM LOAD	RESISTOR R15 SHORTED
40	+11 DBM	+14 DBM
50	+11 "	+14 "
60	+10 "	+13 "
70	+6 "	+11 "

Fig. 4 - 142B Amplifier - Input Circuit Arrangement
(141A Amplifier Schematic)

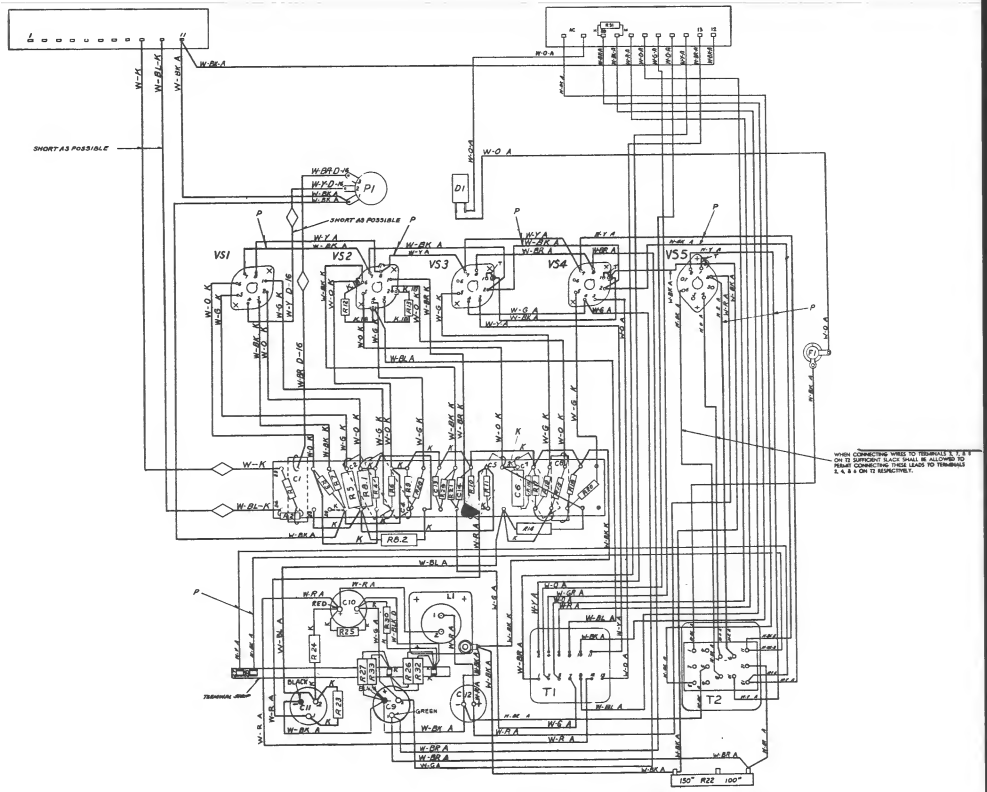


Fig. 7 - 142A Amplifier Wiring Diagram

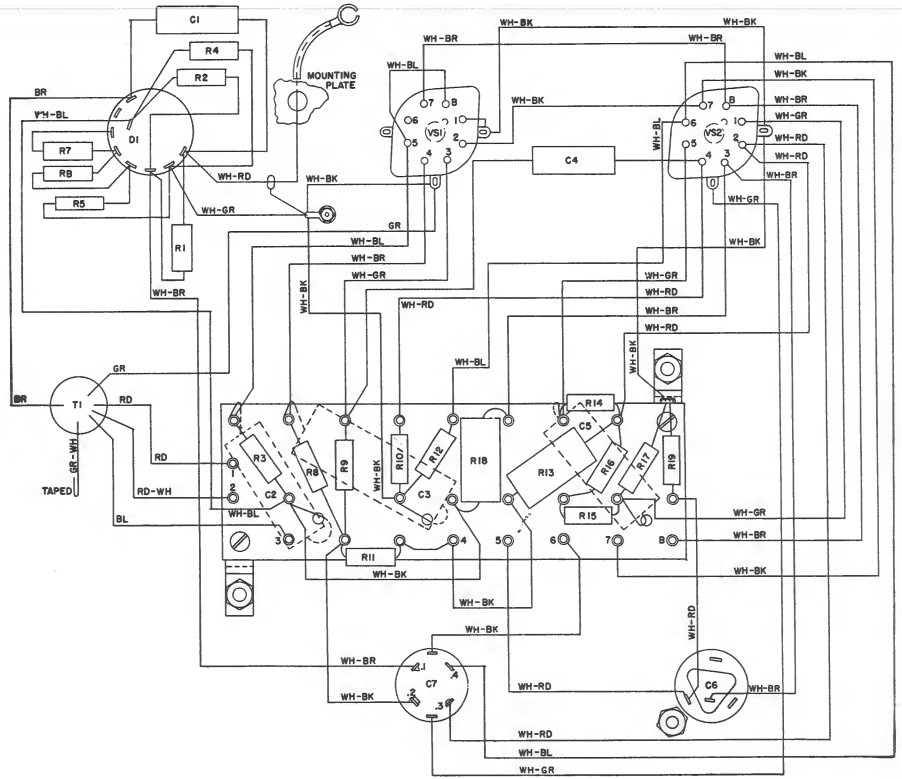


Fig. 8 - 141A Amplifier Wiring Diagram